

- ① A pebble is dropped into a calm pond causing ripples. The radius,  $r$ , of the outer ripple is increasing at a constant rate of 1 foot per second. When the radius is 4 ft. At what rate is the area,  $A$ , of the disturbed water changing?

1<sup>st</sup> step\*

Write eq. to tie variables together (1 independent variable)

$$\rightarrow A = \pi r^2$$

2<sup>nd</sup> step

take deriv.

$$\rightarrow \frac{dA}{dt} = 2\pi r \frac{dr}{dt}$$

3<sup>rd</sup> step

plug in known values

$$\frac{dA}{dt} = 2\pi(4)(1)$$

$$\frac{dA}{dt} = 8\pi \text{ ft}^2/\text{sec}$$

- ② Air is being pumped into a spherical balloon at a rate of  $4.5 \text{ ft}^3/\text{min}$ . Find the rate of change of the radius when  $r = 2 \text{ ft}$ .

$$V = \frac{4}{3}\pi r^3$$

$$4.5 = 4\pi(2)^2 \frac{dr}{dt}$$

$$\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt}$$

$$\frac{4.5}{16\pi} = \left( \frac{dr}{dt} = \frac{9}{32\pi} \approx 0.09 \text{ ft/min} \right)$$

- ③ Use linearizations to approximate  $\sqrt[3]{26}$ . How close is your approximation?

$$f(x) = \sqrt[3]{x}$$

tangent line (linearization)

$$m = f'(x) = \frac{1}{3\sqrt[3]{x^2}}$$

$$pt = (27, 3)$$

$$L(x) = \frac{1}{3\sqrt[3]{27^2}}(x - 27) + 3$$

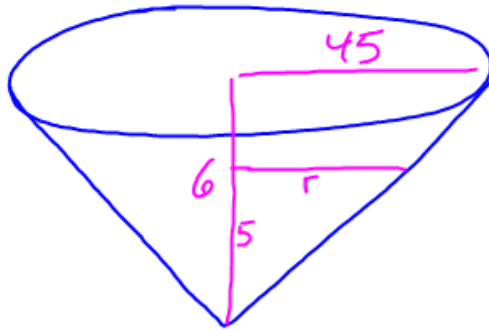
$$L(26) = \frac{1}{3\sqrt[3]{27^2}}(26 - 27) + 3 \approx \frac{80}{27} \approx 2.962$$

for  $L(x)$

every  $x$  is centered pt.  
 $x = 27$

$$\text{Error} = \sqrt[3]{26} - 2.962 \rightarrow \text{less than } 10^{-3}$$

#17



$$\frac{r}{h} = \frac{45}{6}$$

$$r = \frac{45}{6}h$$

$$r = \frac{15}{2}h$$

$$r = 7.5h$$

$$V = \frac{1}{3}\pi r^2 h$$

$$V = \frac{1}{3}\pi (7.5h)^2 h$$

$$V = \frac{1}{3}\pi \cdot 56.25 h^3$$

$$V = 18.75\pi h^3$$

$$\frac{dV}{dt} = 56.25\pi h^2 \frac{dh}{dt}$$

$$-50 = 56.25\pi (5)^2 \frac{dh}{dt}$$

$$\frac{-50}{56.25\pi (25)} = \frac{dh}{dt} \approx -0.0113 \frac{\text{m}}{\text{sec}} \frac{\text{min}}{\text{min}}$$

$$\approx 0.0113 \text{ m/min}$$

18 - Casey

20 - Dustin

21 - Vy

27 - Chris

34 - Jordan

30 - Mike

4.4 #21-23, 27, 31, 33, 36, 40,  
41, 45

35, 37, 47

Due Thurs.